



π IN THE SKY⁸

How much stronger is a signal sent with near-infrared light? NASA solves this real problem to explore space and – with pi as your guide – so can you!

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SIGNAL SOLUTION

As more and more data are collected and transmitted through space, NASA needs new technologies to communicate faster and more efficiently with its spacecraft. One such technology is called Deep Space Optical Communications, or DSOC, which uses near-infrared light instead of radio waves to transmit a signal. This allows us to use a higher frequency (shorter wavelength) so more data can be transmitted per second.

The twin Voyager spacecraft launched in 1977 use a 12.5 watt transmitter paired with a parabolic reflector that creates a circular radio signal with a diameter roughly 0.5 degrees wide. A DSOC system would use a 4 watt transmitter on a flight laser transceiver, producing a light signal with a diameter of 0.0009 degrees.

If Voyager and a DSOC-equipped spacecraft were both placed 124 AU from Earth (1 AU = 150,000,000 km) what fraction of each original wattage would be received by a 70 meter antenna on Earth?

By what factor is DSOC more effective?

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